

Claims

- 5 1. A method of controlling a sending peer of a data unit transmission protocol, said sending peer being capable of dividing a data symbol stream into data units of at least a first format and a second format and sending said data symbol stream in the form of said data units of said first format or said second format to a receiving peer, comprising:
- 10 - maintaining a first record of said data symbol stream in terms of one or more first sequences of data units of said first format,
- 15 - simultaneously maintaining a second record of said data symbol stream in terms of one or more second sequences of data units of said second format, where said first record and said second record have a common reference point to said data symbol stream,
- 20 - dynamically switching between a first transmission mode for sending data units of said first format and a second transmission mode for sending data units of said second format, where each sent data unit of said first format comprises a sequence position indicator that indicates a position in one of said first sequences and each sent data unit of said second format comprises a sequence position indicator that indicates a position in one of said second sequences, where
- 25 -- after switching from said first transmission mode to said second transmission mode, the transmission continues with a given data unit of one of said second sequences comprising a position indicator such that said given data unit comprises a data symbol immediately following the last data symbol of said data symbol stream that was sent in the data unit of said first format last sent before said switching, and
- 30 -- after switching from said second transmission mode to said first transmission mode, the transmission continues
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with a given data unit of one of said first sequences comprising a position indicator such that said given data unit comprises a data symbol immediately following the last data symbol of said data symbol stream that was sent in the data unit of said second format last sent before said switching.

2. The method of claim 1, wherein said common reference point is implicitly defined with respect to said sequence position indicators.

3. The method of claim 1 or 2, wherein said sending peer sends a reference point synchronization message to said receiving peer for setting said reference point.

4. The method of one of claims 1 to 3, wherein said sending peer is a link layer peer.

5. The method of one of claims 1 to 4, wherein said data units of said first format are sent over one or more first transmission channels and said data units of said second format are sent over one or more second transmission channels.

6. The method of one of claims 1 to 5, wherein upon switching from one of said first and second transmission modes to the other of said first and second transmission modes, a message indicating an associated switching in data unit format is sent by said sending peer.

7. The method of one of claims 1 to 6, wherein each data unit sent by said sending peer comprises a format type indicator.

8. The method of one of claims 1 to 7, wherein said second record comprises a first and a second of said second sequences of said data units of said second format, said

second of said second sequences being offset from said first of said second sequences by a predetermined offset amount with respect to said reference point.

5 9. The method of claim 8, wherein after switching from said first transmission mode to said second transmission mode, said sending peer determines the given data unit of said first of said second sequences that comprises the data symbol immediately following the last data
10 symbol of said data symbol stream that was sent in the last sent data unit of said first format, and determines the given data unit of said second of said second sequences that comprises the data symbol immediately following the last data symbol of said data symbol
15 stream that was sent in the last sent data unit of said first format, determines which of said given data units comprises less data symbols already sent with the last data unit of said first format, and continues the transmission with that one sequence of said second
20 sequences to which the given data unit with less of said data symbols belongs.

10. The method of claim 8 or 9, wherein each data unit sent by said sending peer comprises an offset indicator.

25 11. The method of one of claims 1 to 10, wherein said receiving peer sends receiver status messages to said sending peer, said receiver status messages comprising information on the receipt of one or more of said data
30 units, said data units being identified in terms of sequence position indicators associated with one of said first sequences, said method furthermore comprising

a retransmission procedure for retransmitting data units
35 on the basis of said receiver status messages, and

a procedure for determining one or more second sequence position indicators associated with one of said second sequences on the basis of a given first sequence position indicator, where the one or more data units of said second format associated with said one or more second sequence position indicators cover all of the data symbols contained in the given data unit of said first format associated with said first sequence position indicator,

where said retransmission procedure retransmits said data units of said second format associated with said one or more second sequence position indicators.

12. A computer program arranged to perform the method of one of claims 1 to 11 when executed on a computer device arranged as a sending peer of a data unit transmission protocol.

13. A method of controlling a receiving peer of a data unit transmission protocol, where said receiving peer receives a data symbol stream in the form of data units of a first format or a second format from a sending peer, comprising:

- identifying a sequence position indicator in each received data unit, said sequence position indicator indicating a position of said received data unit in a respective sequence to which said received data unit belongs, where said data units of said first format belong to one of one or more first sequences of data units of said first format, and said data units of said second format belong to one of one or more second sequences of data units of said second format,
- detecting a switching of said sending peer between a first transmission mode for sending data units of said first format and a second transmission mode for sending data units of said second format, and

- reconstructing said data symbol stream on the basis of said identified sequence position indicators and said detected switching.

5 14. The method of claim 13, wherein said receiving peer is a link layer peer.

10 15. The method of claim 13 or 14, wherein said data units of said first format are sent over one or more first transmission channels, said data units of said second format are sent over one or more second transmission channels, and said step of detecting said switching comprises determining over which transmission channel said data units are received.

15 16. The method of one of claims 13 to 15, said step of detecting said switching comprises detecting a message sent by said sending peer indicating an associated switching in data unit format.

20 17. The method of one of claims 13 to 16, wherein each data unit sent by said sending peer comprises a format type indicator, and said step of detecting said switching comprises monitoring said format type indicators.

25 18. The method of one of claims 13 to 17, wherein said reconstructing is furthermore based on a common reference point of said one or more first sequences and said one or more second sequences to said data symbol stream.

30 19. The method of one claim 18, wherein said common reference point is implicitly defined with respect to said sequence position indicators.

35 20. The method of claim 18 or 19, wherein said receiving peer receives a reference point synchronization message

from said sending peer and sets said common reference point on the basis of said reference point synchronization message.

- 5 21. The method of one of claims 18 to 20, wherein said step of reconstructing furthermore comprises a step of identifying duplicate data symbols contained in data symbols of said first format and data symbols of said second format on the basis of said common reference point.
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22. The method of one of claims 13 to 19, wherein said step of reconstructing comprises a step of identifying duplicate data symbols contained in data symbols of said first format and data symbols of said second format on the basis of dedicated messages sent from said sending peer to said receiving peer that identify said duplicate data symbols.
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- 20 23. The method of one of claims 13 to 22, wherein said receiving peer sends receiver status messages to said sending peer, said receiver status messages comprising information on the receipt of one or more of said data units, said method furthermore comprising a procedure for determining one or more second sequence position indicators associated with one of said second sequences on the basis of a first sequence position indicator associated with one of said first sequences, where the one or more data units of said second format associated with said determined one or more second sequence position indicators cover all of the data symbols contained in the data unit of said first format associated with said first sequence position indicator, for identifying in said receiver status messages said data unit of said first format in terms of said determined one or more second sequence position indicators.
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24. The method of claim 23, furthermore comprising a
procedure for determining one or more first sequence
position indicators associated with one of said first
5 sequences on the basis of a second sequence position
indicator associated with one of said second sequences,
where the one or more data units of said first format
associated with said determined one or more first
sequence position indicators cover all of the data
10 symbols contained in the data unit of said second format
associated with said second sequence position indicator,
for identifying in said receiver status messages said
data unit of said second format in terms of said
determined one or more first sequence position
15 indicators.
25. The method of claim 23 or 24, furthermore comprising a
procedure for generating receiver status messages
comprising one or both of said first and second sequence
20 position indicators depending on one or more
predetermined optimisation functions.
26. A computer program arranged to perform the method of one
of claims 13 to 25 when executed on a computer device
25 arranged as a receiving peer of a data unit transmission
protocol.
27. A data unit sender comprising a sending peer of a data
unit transmission protocol and being arranged for
30 dividing a data symbol stream into data units of at
least a first format and a second format, and sending
said data symbol stream in the form of said data units
of said first format or said second format, comprising a
record keeping part arranged for maintaining a first
35 record of said data symbol stream in terms of one or
more first sequences of data units of said first format,
and for simultaneously maintaining a second record of

said data symbol stream in terms of one or more second sequences of data units of said second format, where said first record and said second record have a common reference point to said data symbol stream.

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28. The data unit sender of claim 27, comprising a switching part for dynamically switching between a first transmission mode for sending data units of said first format and a second transmission mode for sending data units of said second format, where each sent data unit of said first format comprises a sequence position indicator that indicates a position in one of said first sequences and each sent data unit of said second format comprises a sequence position indicator that indicates a position in one of said second sequences, and a data unit output part arranged such that

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-- after said switching part switches from said first transmission mode to said second transmission mode, said data unit output part continues the transmission with a given data unit of one of said second sequences comprising a position indicator such that said given data unit comprises a data symbol immediately following the last data symbol of said data symbol stream that was sent in the data unit of said first format last sent before said switching, and

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-- after said switching part switches from said second transmission mode to said first transmission mode, said data unit output part continues the transmission with a given data unit of one of said first sequences comprising a position indicator such that said given data unit comprises a data symbol immediately following the last data symbol of said data symbol stream that was sent in the data unit of said second format last sent before said switching.

29. The data unit sender of claim 27 or 28, wherein said common reference point is implicitly defined with respect to said sequence position indicators.

5 30. The data unit sender of one of claims 27 to 29, further comprising a message sending part for sending a reference point synchronization message to said receiving peer for setting said reference point.

10 31. The data unit sender of one of claims 27 to 30, wherein said sending peer is a link layer peer.

15 32. The data unit sender of one of claims 27 to 31, wherein said data unit sender is connected to one or more first transmission channels for transmitting said data units of said first format and to one or more second transmission channels for transmitting said data units of said second format.

20 33. The data unit sender of one of claims 27 to 32, wherein said data unit sender is arranged to output a message indicating a switching in data unit format upon said switching part switching from one of said first and second transmission modes to the other of said first and second transmission modes.

25 34. The data unit sender of one of claims 27 to 33, wherein each data unit sent by said sending peer comprises a format type indicator.

30 35. The data unit sender of one of claims 27 to 34, wherein said second record comprises a first and a second of said second sequences of said data units of said second format, said second of said second sequences being offset from said first of said second sequences by a predetermined offset amount with respect to said reference point.

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36. The data unit sender of claim 35, further comprising an information processor that is arranged such that after said switching part switches from said first
5 transmission mode to said second transmission mode, said information processor determines the given data unit of said first of said second sequences that comprises the data symbol immediately following the last data symbol of said data symbol stream that was sent in the last
10 sent data unit of said first format, and determines the given data unit of said second of said second sequences that comprises the data symbol immediately following the last data symbol of said data symbol stream that was sent in the last sent data unit of said first format,
15 determines which of said given data units comprises less data symbols already sent with the last data unit of said first format, and said sending peer continuing the transmission with that one sequence of said second sequences to which the given data unit with less of said
20 data symbols belongs.

37. The data unit sender of claim 35 or 36, wherein said data unit sender is arranged such that each data unit sent by said sending peer comprises an offset indicator.

25 38. The data unit sender of one of claims 27 to 37, wherein said sending peer is arranged to receive receiver status messages from said receiving peer, said receiver status messages comprising information on the receipt of one or
30 more of said data units, said data units being identified in terms of sequence position indicators associated with one of said first sequences, furthermore comprising

35 a retransmission part for retransmitting data units on the basis of said receiver status messages, and

an information processor for determining one or more second sequence position indicators associated with one of said second sequences on the basis of a given first sequence position indicator, where the one or more data units of said second format associated with said one or more second sequence position indicators cover all of the data symbols contained in the given data unit of said first format associated with said first sequence position indicator,

said retransmission part being arranged to retransmit said data units of said second format associated with said one or more second sequence position indicators.

39. A data unit receiver comprising a receiving peer of a data unit transmission protocol, where said receiving peer is arranged to receive a data symbol stream in the form of data units of a first format or a second format from a sending peer, comprising:

- a sequence position identifier for identifying a sequence position indicator in each received data unit, said sequence position indicator indicating a position of said received data unit in a respective sequence to which said received data unit belongs, where said data units of said first format belong to one of one or more first sequences of data units of said first format, and said data units of said second format belong to one of one or more second sequences of data units of said second format,

- a switching detector for detecting a switching of said sending peer between a first transmission mode for sending data units of said first format and a second transmission mode for sending data units of said second format, and

- a data symbol stream reconstruction part for reconstructing said data symbol stream on the basis of

said identified sequence position indicators and said detected switching.

40. The data unit receiver of claim 39, wherein said receiving peer is a link layer peer.

41. The data unit receiver of one of claims 39 or 40, wherein said data unit receiver is connected to one or more first transmission channels for receiving said data units of said first format and to one or more second transmission channels for receiving said data units of said second format.

42. The data unit receiver of one of claims 39 to 41, wherein said switching detector is arranged for detecting a message sent by said sending peer indicating an associated switching in data unit format.

43. The data unit receiver of one of claims 39 to 42, wherein each data unit sent by said sending peer comprises a format type indicator, and said switching detector is arranged for monitoring said format type indicators.

44. The data unit receiver of one of claims 39 to 43, wherein data symbol stream reconstruction part is furthermore arranged to reconstruct said data symbol stream on the basis of a common reference point of said one or more first sequences and said one or more second sequences to said data symbol stream.

45. The data unit receiver of claim 44, wherein said common reference point is implicitly defined with respect to said sequence position indicators.

46. The data unit receiver of claim 44 or 45, wherein said receiving peer has a receiving part for receiving a

reference point synchronization message from said sending peer and a setting part for setting said common reference point on the basis of said reference point synchronization message.

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47. The data unit receiver of one of claims 44 to 46,
wherein said data symbol stream reconstruction part is
arranged to identify duplicate data symbols contained in
data symbols of said first format and data symbols of
10 said second format on the basis of said common reference
point.

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48. The data unit receiver of one of claims 39 to 47,
wherein said data symbol stream reconstruction part is
arranged for identifying duplicate data symbols
contained in data symbols of said first format and data
symbols of said second format on the basis of dedicated
messages sent from said sending peer to said receiving
peer that identify said duplicate data symbols.

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49. The data unit receiver of one of claims 39 to 49,
further comprising a message generator for generating
and sending receiver status messages to said sending
peer, said receiver status messages comprising
25 information on the receipt of one or more of said data
units, said data unit receiver furthermore comprising an
information processor for determining one or more second
sequence position indicators associated with one of said
second sequences on the basis of a first sequence
30 position indicator associated with one of said first
sequences, where the one or more data units of said
second format associated with said determined one or
more second sequence position indicators cover all of
the data symbols contained in the data unit of said
35 first format associated with said first sequence
position indicator, for identifying in said receiver
status messages said data unit of said first format in

terms of said determined one or more second sequence position indicators.

50. The data unit receiver of claim 49, said information
5 processor furthermore being arranged for determining one
or more first sequence position indicators associated
with one of said first sequences on the basis of a
second sequence position indicator associated with one
10 of said second sequences, where the one or more data
units of said first format associated with said
determined one or more first sequence position
indicators cover all of the data symbols contained in
the data unit of said second format associated with said
15 second sequence position indicator, for identifying in
said receiver status messages said data unit of said
second format in terms of said determined one or more
first sequence position indicators.

51. The data unit receiver of claim 49 or 50, wherein said
20 message generator is furthermore arranged for generating
receiver status messages comprising one or both of said
first and second sequence position indicators depending
on one or more predetermined optimisation functions.

25 52. A method of keeping a record of a data transmission in a
sending peer of a data unit transmission protocol, said
sending peer being capable of dividing a data symbol
stream into data units of at least a first format and a
second format, and sending said data symbol stream in
30 the form of said data units of said first format or said
second format, comprising:
- maintaining a first record of said data symbol stream
in terms of one or more first sequences of data units of
said first format, and
35 - simultaneously maintaining a second record of said
data symbol stream in terms of one or more second
sequences of data units of said second format, where

said first record and said second record have a common reference point to said data symbol stream.